

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-250591

(43)Date of publication of application : 14.09.2001

(51)Int.Cl.

H01M 10/48

H01L 33/00

H01M 2/16

H01M 10/40

(21)Application number : 2000-058077

(71)Applicant : NISSAN MOTOR CO LTD

(22)Date of filing : 03.03.2000

(72)Inventor : HORIE HIDEAKI

SHIMAMURA OSAMU

ABE TAKAAKI

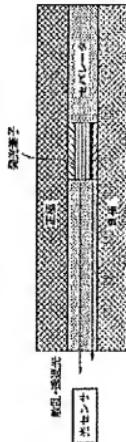
MUNAKATA FUMIO

## (54) CONSTRUCTION OF BATTERY STATE DETECTING ELEMENT

### (57)Abstract:

PROBLEM TO BE SOLVED: To provide a construction of battery state detecting elements, capable of substantial improvement in volumetric efficiency and of reducing cost.

SOLUTION: A cell circuit is arranged directly on an electrode which is a main component member of the cell. More specifically, a light-emitting element is arranged integrally and pierces through a separator.



## \* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

CLAIMS

## [Claim(s)]

[Claim 1]It has a stoma in a separator (\*\* ion insulating layer) inserted in a rechargeable battery, especially a lamination type solid state electrode cell between a cathode which constitutes a cell, and an anode which counters. It has composition of installing a semiconductor light emitting element in the stoma, and exposing a cathode and an anode of a semiconductor light emitting element to a confrontation of a separator, respectively, and contacting a cathode and an anode of a cell electrode, Battery state detector element composition when it has the characteristic which will emit light if regular voltage is reached and said light emitting device emits [ a semiconductor device ] light according to a potential state of a cell, wherein it performs simultaneously full charge state detecting of a cell, and a discharge operation.

[Claim 2]Battery state detector element composition installing a semiconductor light emitting element in the battery state detector element composition according to claim 1 by coordination which emits light to a separator cross sectioned direction, and the separator concerned having permeability to a light wavelength of a semiconductor light emitting element, and having the function to draw light out of a cell.

[Claim 3]Battery state detector element composition characterized by composition which had luminescent semiconductor minute crystals underground inside a separator as said light emitting device in the battery state detector element composition according to claim 1.

[Claim 4]Battery state detector element composition, wherein it is the cell group with which unit cells gathered and each cell is the composition according to any one of claims 1 to 3.

[Claim 5]Battery state detector element composition, wherein an ion conduction part is polymer ion conduction material or the solid state battery constituted by an inorganic ion conductor.

[Claim 6]Battery state detector element composition using a lithium ion as a medium which conveys positive charge.

[Claim 7]Battery state detector element composition, wherein electrolysis solution-proof nature uses a nitride especially GaN, AlN, and SiN as said semiconductor material as a light emitting device, using a high semiconductor material.

[Claim 8]Battery state detector element composition using LiMnO<sub>2</sub> as a cathode in the battery state detector element composition according to any one of claims 1 to 6.

[Claim 9]Battery state detector element composition using hard carbon as an anode in the battery state detector element composition according to any one of claims 1 to 6.

[Claim 10]Battery state detector element composition carrying out compression adherence of a part of separator for a thin light emitting device with heat etc., providing a thin film part of a separator, providing a deficit in the thin film part concerned in part further, and installing a thin element.

[Claim 11]Battery state detector element composition providing a thin film part of light reflex nature between a separator and a positive-and-negative-poles electrode material.

---

[Translation done.]

**\* NOTICES \***

JP0 and INPIT are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

**DETAILED DESCRIPTION****[Detailed Description of the Invention]**

[0001]

[Field of the Invention]This invention relates to battery state detector element composition.

[0002]

[Description of the Prior Art]If a surcharge is carried out, a cell causes degradation etc. and cannot secure battery capacity. In a lithium ion battery, the balance between cells needs to be secured. As mentioned above, in constituting a cell group, the Celcon troller for cell group control is needed.

[0003]

[Problem to be solved by the invention]However, in the conventional Celcon troller, SUBJECT that \*\* and the circuit which install a circuit component in an electrode require an installation area greatly occurred after cell manufacture. Since it has potential which the wiring which connects each was connected between each cell and the Celcon troller, and is different, installation becomes complicated. In lamination electrodes, such as a bipolar battery, SUBJECT with difficulty had installation of a circuit.

[0004]In view of the above situation, a cell circuit is directly installed on the electrode which is a main component of a cell. It is penetrating to a separator and specifically installing a light emitting device in one, and aims at solving the above-mentioned problem.

[0005]

[Means for solving problem]In order that this invention may solve above-mentioned SUBJECT, the invention according to claim 1, It has a stoma in the separator (\*\* ion insulating layer) inserted in the rechargeable battery, especially the lamination type solid state electrode cell between the cathode which constitutes a cell, and the anode which counters, It has the composition of installing a semiconductor light emitting element in the stoma, and exposing the cathode and anode of a semiconductor light emitting element to the confrontation of a separator, respectively, and contacting the cathode and anode of a cell electrode. Said light emitting device performs simultaneously the full charge state detecting of a cell, and a discharge operation, when it has the characteristic which will emit light if regular voltage is reached and a semiconductor device emits light according to the potential state of a cell.

[0006]In the battery state detector element composition according to claim 1 the invention according to claim 2, A semiconductor light emitting element is installed in a separator cross sectioned direction by the coordination which emits light, the separator concerned has permeability to the light wavelength of a semiconductor light emitting element, and it has the function to draw light out of a cell.

[0007]The invention according to claim 3 is characterized by the composition which had luminescent semiconductor minute crystals underground inside the separator as said light emitting device in the battery state detector element composition according to claim 1.

[0008]The invention according to claim 4 is the cell group with which unit cells gathered, and is characterized by each cell being the composition according to any one of claims 1 to 3.

[0009]The invention according to claim 5 is characterized by an ion conduction part being polymer ion conduction material or the solid state battery constituted by the inorganic ion conductor.

[0010]The invention according to claim 6 uses a lithium ion as a medium which conveys positive charge.

[0011]The invention according to claim 7 uses a nitride especially GaN, AlN, and SiN as said semiconductor material, using a semiconductor material with electrolysis solution-proof nature high as a light emitting device.

[0012]The invention according to claim 8 uses LiMn<sub>2</sub>O<sub>4</sub> as a cathode in the battery state detector element composition according to any one of claims 1 to 6.

[0013]The invention according to claim 9 uses hard carbon as an anode in the battery state detector element composition according to any one of claims 1 to 6.

[0014]The invention according to claim 10 carries out compression adherence of a part of separator for a thin light emitting device with heat etc., provides the thin film part of a separator, provides a deficit in the thin film part concerned in part further, and installs a thin element.

[0015]The invention according to claim 11 provided the thin film part of light reflex nature between the separator and the positive-and-negative-poles electrode material.

[0016]

[Mode for carrying out the Invention]Hereafter, the embodiment of the battery state detector element composition by this invention is described in detail with reference to an accompanying drawing.

[0017](A 1st embodiment) Drawing 1 is a figure showing a 1st embodiment of the battery state detector element composition

by this invention. A cell comprises a cathode, an anode, and a separator part.

[0018](1) Penetrate to a separator, dig a stoma, and install the high light emitting device of solvent-proof nature in a stoma so that the electrode of a light emitting device may be exposed to both sides of a separator.

(2) Apply positive and negative poles to both sides of a separator, and contact the two poles of a light emitting device to an active material, respectively.

(3) As luminescence starting potential of a light emitting device, it is based on the material selection and the control design of the cell which installs an element, and constitute a light emitting device so that light may be emitted in the full charge potential specified in the fuel cell subsystem concerned.

[0019]As the above-mentioned composition, in the position which positive and negative poles meet, a lacking part can be provided in a part of separator, and the holding part of a lead, a lead, and an electrode and semiconductor device installation section which connect an element can be omitted by having composition which installs a semiconductor light emitting element in the inside of a separator directly. By installing the Celcon troller in an electrode at an integral type, compared with installing and carrying out multiple connection of the cell detection etc. out of the conventional cell, volumetric efficiency improves substantially and it contributes to manufacturing cost reduction as stated above.

[0020](A 2nd embodiment) Drawing 2 is a figure showing a 2nd embodiment of the battery state detector element composition by this invention. A cell comprises a cathode, an anode, and a separator part. The composition which had luminescent semiconductor minute crystals underground inside this separator is taken.

[0021]The semiconductor minute crystals concerned emit light, when a certain voltage is impressed. As luminescence starting potential, it is based on semiconductor material physical properties, and selection of the luminescent semiconductor material concerned and cell is performed so that light may be emitted in the full charge potential specified in the fuel cell subsystem concerned.

[0022]New circuitry is not needed for the inside of a separator at all by having semiconductor light material underground as the above-mentioned composition. By constituting a cell using the separator of semiconductor light material content, a battery system with a sensing function can consist of integral types very easily. The holding part of a lead, a lead, and an electrode and semiconductor device installation section which connect an element can be omitted by this, and volumetric efficiency improves substantially compared with installing and carrying out multiple connection of the cell detection etc. out of the conventional cell, and it contributes to manufacturing cost reduction substantially.

[0023]Electrolysis solution-proof nature can constitute a high small light emitting device from using this nitride as a luminescent semiconductor by the element composition using a nitride especially GaN, AlN, SiN, etc.

[0024](A 3rd embodiment) Drawing 3 is a figure showing a 3rd embodiment of the battery state detector element composition by this invention. A cell comprises a cathode, an anode, and a separator part. Not using the porous membrane separator, a 3rd embodiment mixed insulating particles and a luminescent semiconductor, and constituted them.

[0025]As an ion conductor, a solid or gel types, such as a polymer ion conductor, may be used in addition to an electrolysis solution by a solvent.

[0026]Like the above-mentioned embodiment, the semiconductor minute crystals concerned emit light, when a certain voltage is impressed. As luminescence starting potential, it is based on semiconductor material physical properties, and selection of luminescent semiconductor material concerned and a cell is performed so that light may be emitted in full charge potential specified in the fuel cell subsystem concerned.

[0027]New circuitry is not needed for an inside of a separator at all by having semiconductor light material underground as the above-mentioned composition. By constituting a cell using a separator of semiconductor light material content, a battery system with a sensing function can consist of integral types very easily. A holding part of a lead, a lead, and an electrode and a semiconductor device installation section which connect an element can be omitted by this, and volumetric efficiency improves substantially compared with installing and carrying out multiple connection of the cell detection etc. out of the conventional cell, and it contributes to manufacturing cost reduction substantially.

[0028](A 4th embodiment) Drawing 4 is a figure showing a 4th embodiment of battery state detector element composition by this invention. A cell comprises a cathode, an anode, and a separator part. A 4th embodiment laminates each unit cell.

[0029]As an ion conductor, a solid or gel types, such as a polymer ion conductor, may be used in addition to the electrolysis solution by a solvent.

[0030]Like the above-mentioned embodiment, the light emitting device concerned emits light, when a certain voltage is impressed. It is specified so that light may be emitted in the specified full charge potential as luminescence starting potential.

[0031]A battery system with a sensing function can consist of integral types very easily by installing a light emitting device in a separator part as the above-mentioned composition. It is very difficult to install intensively especially, the holding part of a lead, a lead, and an electrode and semiconductor device which connect an element in the narrow range, when many cells are laminated like a 4th embodiment or it is going to build the cell of bipolar form. With this system, these essential SUBJECT is solvable.

[0032]

[Effect of the Invention]As mentioned above, as explained in detail, according to this invention, on the concrete target which installs a cell circuit directly on the electrode which is a main component of a cell. It becomes possible to provide the battery state detector element composition which can plan improvement in large of volumetric efficiency, and cost reduction by penetrating to a separator and installing a light emitting device in one.

[Translation done.]